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JP 070074691 A US 5327584 A

(58) Field of Search

UK CL (Edition P) H4L LECSX LECX
INT CL⁶ H04B 1/40 1/44 1/48, H04M 1/02
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(54) Abstract Title

Foldable portable telephone set with automatic off-hook function

(57) A foldable portable telephone set is foldable so as to be conveniently carried, and allows speech communication when it is open. A light-emitting portion (1) emits light when an incoming call is received, and a light-detecting portion (2) detects light from the light-emitting portion when the telephone set is folded but, when the telephone set is open, the light-detecting portion cannot detect light from the light-emitting portion. Light is emitted from the light-emitting portion when an incoming call is received. If light from the light-emitting portion is detected and then the telephone is opened so that the light ceases to be detected, the foldable portable telephone set automatically shifts to a speech communication mode.

FIG. 2A

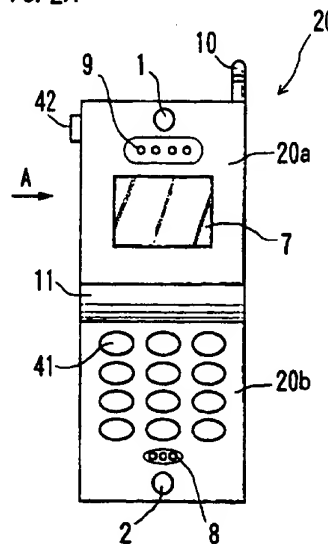
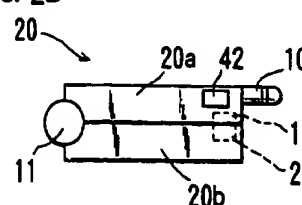


FIG. 2B



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FIG. 1

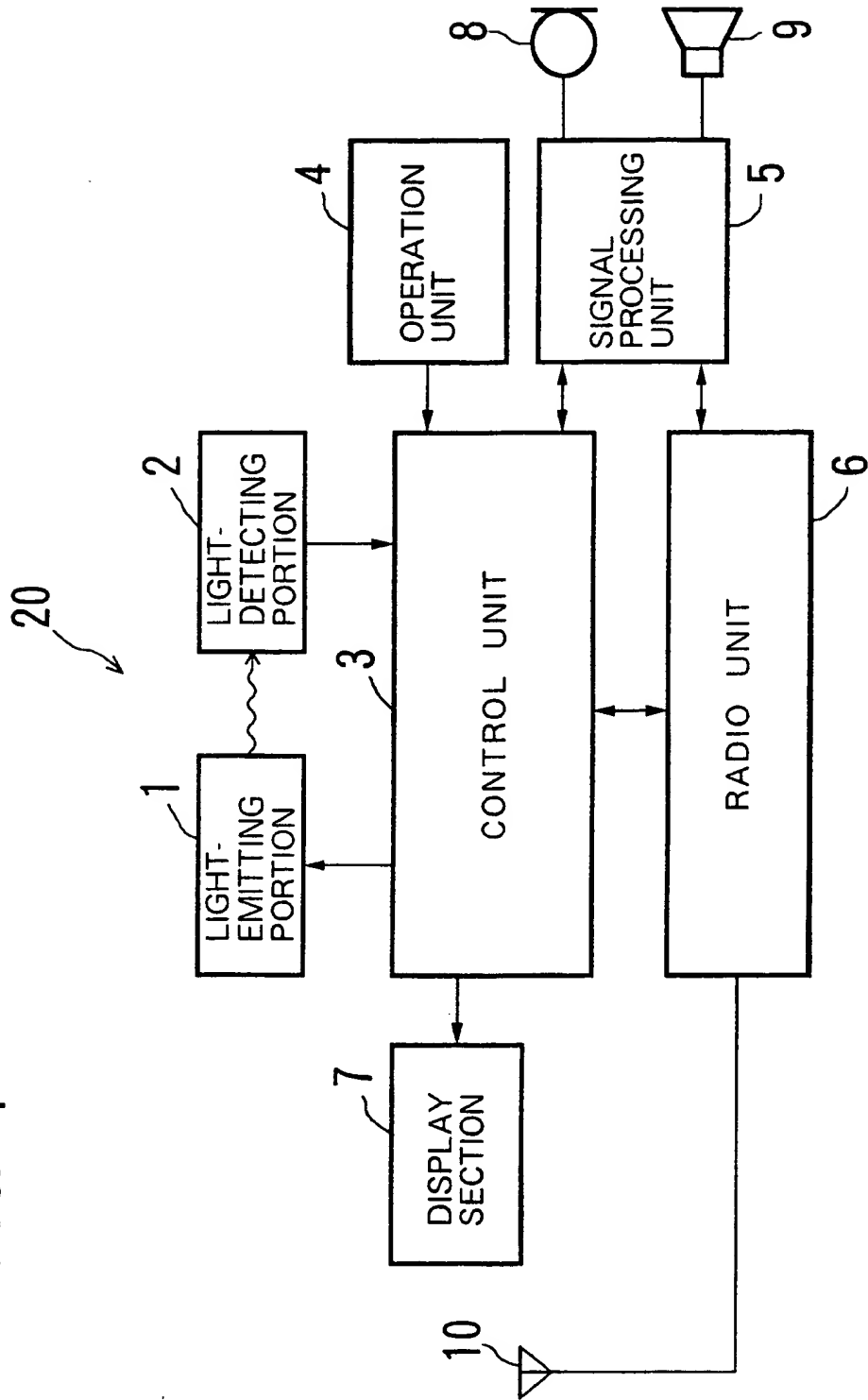


FIG. 2A

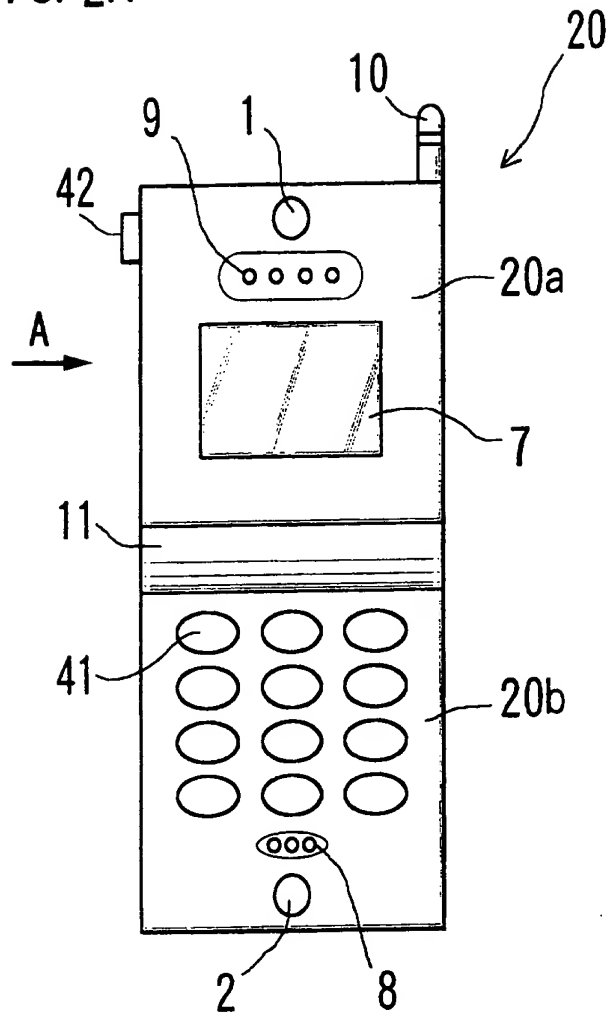


FIG. 2B

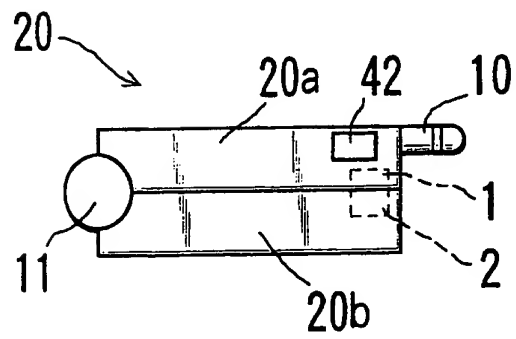


FIG. 3

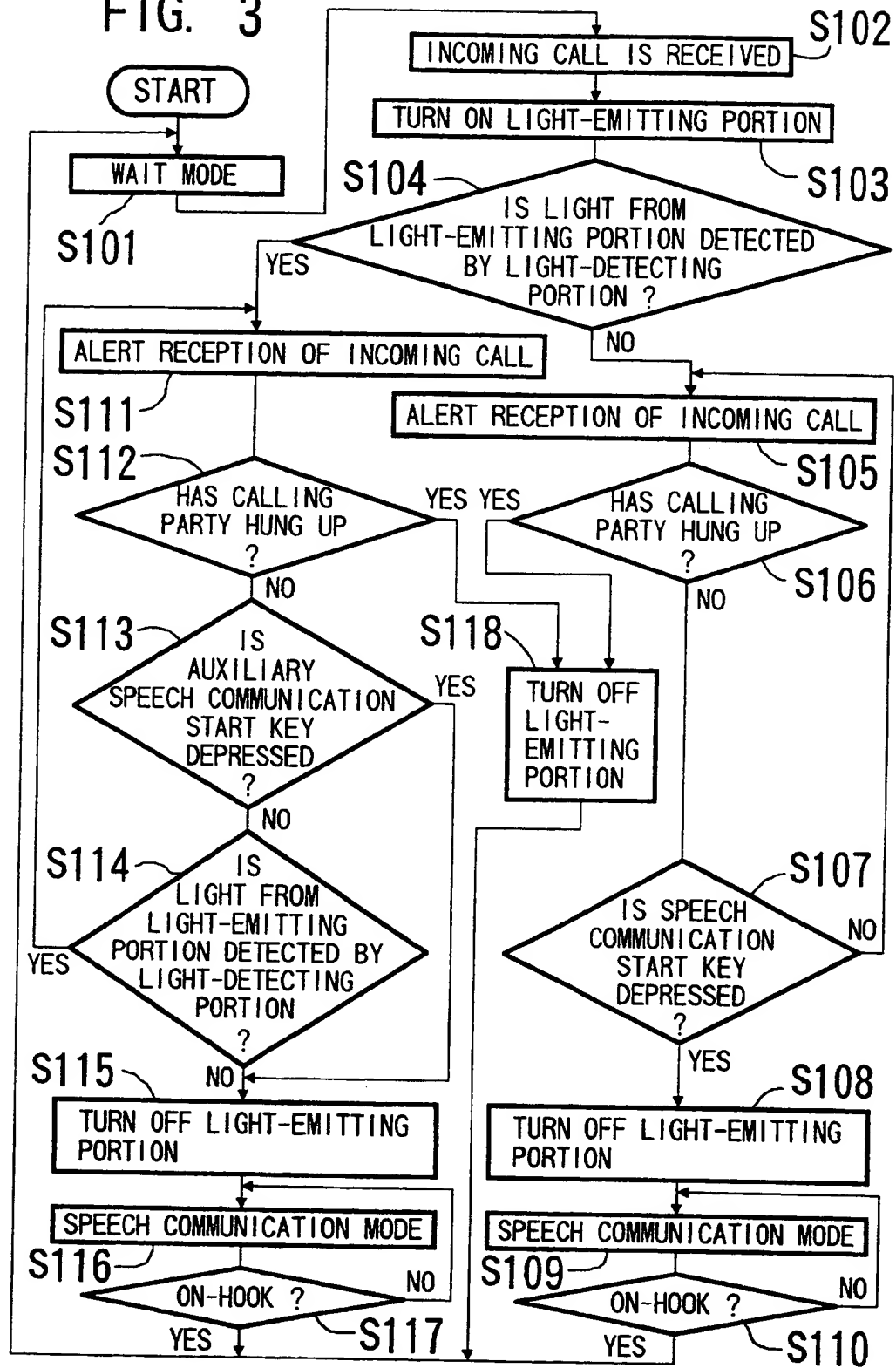
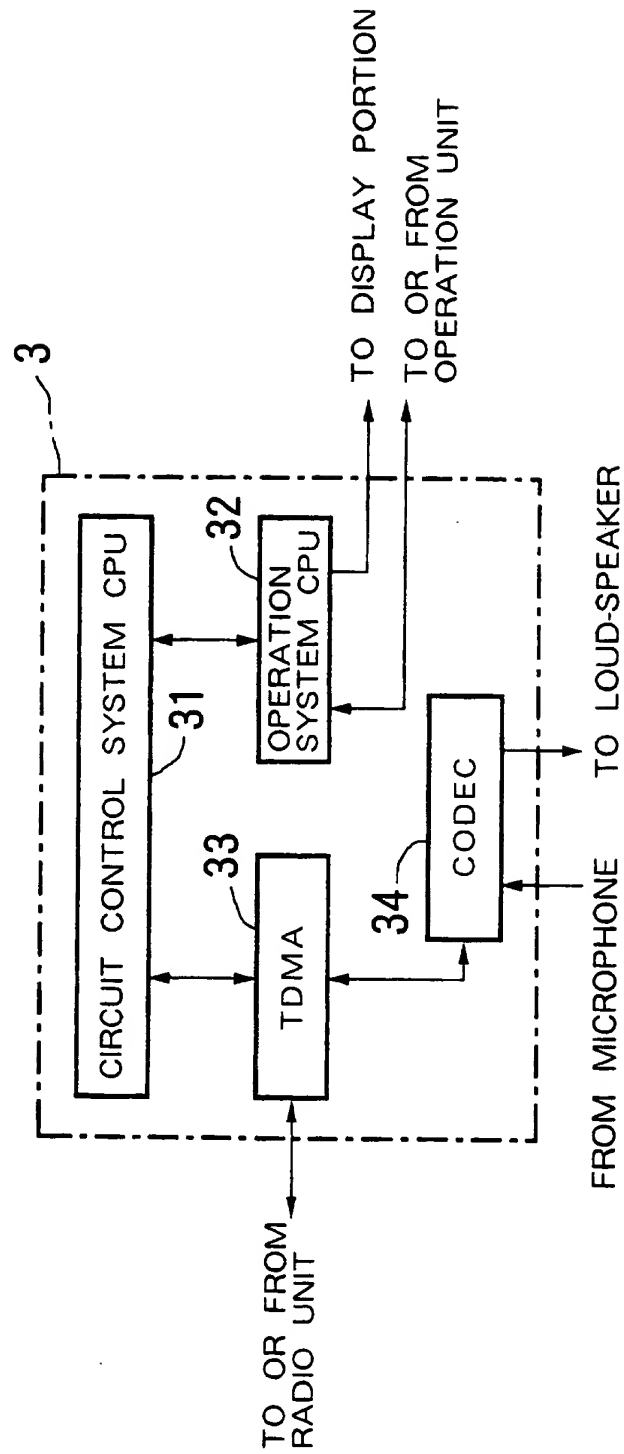


FIG. 4



- 1 -

FOLDABLE PORTABLE TELEPHONE SET
WITH AUTOMATIC OFF-HOOK FUNCTION

The present invention relates to a foldable portable telephone set and, more particularly, to a foldable portable telephone set with an automatic off-hook function.

10 In a portable telephone set, upon reception of an incoming call, a ringing tone is generated and at the same time a termination light-emitting portion (e.g., an LED) is turned on or flashes in order to inform the user of this. The user depresses a speech communication start key or a key having a similar function
15 to go off hook, so that he or she can start a speech communication.

 A foldable portable telephone set has two states, i.e., folded and open and calls may arrive in both states. Usually, the user carries the portable telephone folded, and accordingly calls are received in this state more often. When an incoming
20 call is received as the telephone set is folded, the user must perform two operations, i.e., opening the portable telephone set to start a speech communication, and depressing the speech

communication start key to go off hook.

In a prior art, a function similar to a speech communication start key (off-hook key) is merely assigned to a specific key that can be depressed even as the telephone is folded. In this case
5 as well, two operations are needed, i.e., opening the portable telephone set and depressing the speech communication start key.

In the foldable portable telephone set, various control operations may be performed after whether the portable telephone set itself is folded or open is confirmed. For example, Japanese
10 Unexamined Patent Publication No. 7-74691 discloses a technique for monitoring whether the portable telephone set is folded or open, in order to control power consumption. According to this technique, whether the portable telephone set is folded or open is determined by using a photosensor and an LED which constantly
15 flashes when the power supply is ON.

In the known foldable portable telephone set, when an incoming call is received as the telephone set is folded, two operations of opening the portable telephone set and depressing the speech communication start key are required. These series
20 of operations are tedious for the user to perform.

If whether the portable telephone set is folded or open is to be monitored by using a photosensor and an LED which flashes

constantly, the power consumption of the LED increases. This cuts the wait time and speech communication time of the portable telephone set short.

5 The present invention has been made in view of the above situations in the prior art, and embodiments aim to provide a foldable portable telephone set in which, when an incoming call is received as the telephone set is folded, operations required before start of a speech communication can be facilitated.

Another aim is to provide a foldable portable telephone set in which, when whether the portable telephone set is folded or open is to be monitored by using a light-emitting portion and a photosensor, the power consumption of the light-emitting portion is minimized, and so
15 the wait time and the speech communication time can be prolonged.

The invention is defined in the independent claims appended herein, to which reference should now be made. Further, preferred features are described in the dependent claims.

According to a principal aspect of the present invention, there is provided a foldable portable telephone set, which is foldable so as to be conveniently carried and allows a speech communication in an open
20 state, and in which a light-emitting portion which emits light when an incoming call is received and a light-detecting portion which detects light from the light-emitting portion are arranged

such that, in a folded state, the light-detecting portion can detect light from the light-emitting portion, and in an open state, the light-detecting portion cannot detect light from the light-emitting portion, the foldable portable telephone set comprising an automatic off-hook function so that, after light emission of the light-emitting portion is started when an incoming call is received, if light from the lightemitting portion is detected once by the light-detecting portion but is not detected by the light-detecting portion again immediately thereafter, the foldable portable telephone set is automatically shifted to a speech communication mode even if speech communication start operation is not performed.

When the foldable portable telephone set is formed as in the principal aspect described above, when an incoming call is received as the telephone set is folded, the user can start a speech communication by only opening the portable telephone set.

If the light-emitting portion emits light only during the transition time between immediately after the termination and start of the speech communication mode, the power consumption of the light-emitting portion can be decreased.

Whether the foldable portable telephone set is folded or open can be determined by

optical detection. When an incoming call is received as the telephone set is folded, the user can start a speech communication by only opening the portable telephone set. Therefore, the burden of user operation can be alleviated.

5 Since the light-emitting portion used for detection of the folded/open state operates only during the transition time between immediately after the termination and start of the speech communication mode, the power consumption of the light-emitting portion can be decreased, and the wait time and speech
10 communication time can be prolonged.

The invention may be carried into practice in various ways, but an embodiment will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a block diagram showing the entire arrangement of a foldable portable telephone set according to an embodiment of the present invention;

15 Fig. 2A is a plan view showing the open foldable portable telephone set according to the embodiment and Fig. 2B is a side view showing the folded telephone set;

Fig. 3 is a flow chart showing the operation of the foldable portable telephone set according to the embodiment of the present invention; and

20 Fig. 4 is a block diagram showing an example of the arrangement of the control unit of the foldable portable telephone set according to an embodiment of the present invention.

5 The entire arrangement of a foldable portable telephone set
(to be referred to merely as a portable telephone hereinafter)
according to an embodiment of the present invention will be
described with reference to the block diagram shown in Fig. 1.

As shown in Fig. 1, a portable telephone set 20 as a
10 communication unit according to this embodiment has a radio unit
6, a signal processing unit 5, an operation unit 4, a display
7, a light-emitting portion 1, a light-detecting portion 2, and
a control unit 3. The radio unit 6 modulates or demodulates a
signal which is to be transmitted or is received through an antenna
15 10. The signal processing unit 5 performs processing required
for transmitting, through the radio unit 6, a speech signal input
from a microphone 8 and for outputting, through a loudspeaker
9, a signal received through the radio unit 6. The operation unit
4 includes various types of operation keys for performing
20 telephone speech communication, transmission, and data input.
The display section 7 displays a telephone number, data, and
the like. When an incoming call is received, the light-emitting

portion 1 informs the user of it by light emission. The light-detecting portion 2 detects light emitted by the light-emitting portion 1. The control unit 3 controls the entire operation of the portable telephone set 20. In this embodiment, as shown in Figs. 2A and 2B, an auxiliary speech communication start key 42 having a function similar to that of a speech communication start key (off-hook key) 41 is formed on the side surface of the portable telephone set 20, such that it can be depressed even when the portable telephone set 20 is folded.

10 The mechanism of the portable telephone set 20 according to this embodiment will be described with reference to Figs. 2A and 2B. Fig. 2A is a plan view showing the open portable telephone set 20. Fig. 2B is a side view showing the folded portable telephone set 20, which is seen from the direction of an arrow 15 A in Fig. 2A.

As shown in Fig. 2A, in the portable telephone set 20, an upper half portion 20a and a lower half portion 20b are connected to each other through a hinge 11 so that the portable telephone set 20 can be folded.

20 The light-emitting portion 1 is disposed on the upper half portion 20a, while the light-detecting portion 2 on the lower half portion 20b. When the portable telephone set 20 is folded,

as shown in Fig. 2B, the light-emitting portion 1 and light-detecting portion 2 overlap each other. Accordingly, while the light-emitting portion 1 emits light or flashes, if the portable telephone set 20 is folded, the light-detecting portion 2 can detect light emitted by the light-emitting portion 1. If the portable telephone set 20 is open, the light-detecting portion 2 cannot detect light emitted by the light-emitting portion 1.

The operation of the portable telephone set 20 according to this embodiment will be described with reference to the flow chart of Fig. 3 and the entire arrangement diagram of Fig. 1.

When the power supply key (not shown) of the operation unit 4 is turned on, the portable telephone set 20 is set in the wait mode (S101). When an incoming call is received through the antenna 10, the radio unit 6, and the signal processing unit 5 (S102), the control unit 3 outputs, to the light-emitting portion 1, a control signal that causes the light-emitting portion 1 to flash (or to emit light), to turn it on (S103), and receives indications that the light source is emitting the light and that the light detector is receiving the emitted light, and further monitors whether the light-detecting portion 2 detects light from the light-emitting portion 1 and sends back a light-detection

signal (S104).

Subsequently, the control unit 3 alerts reception of an incoming call (including informing the user of the call arrival by the sound of a ringing tone, vibration, or the like) (S105
5 or S111).

When the light-detecting portion 2 does not detect light from the light-emitting portion 1, the portable telephone set 20 is open. The alert is continued until the calling party hangs up (S106) or until the speech communication start key 41 is
10 depressed. When the control unit 3 detects that the speech communication start key 41 is depressed (S107), the light-emitting portion 1 is turned off, the alert is stopped (S108), and the portable telephone set 20 is shifted to the speech communication mode (S109).

15 In step S104, if the light-detecting portion 2 detects light from the light-emitting portion 1 and sends a light-detection signal to the control unit 3, it is determined that the portable telephone set 20 is closed, and the control unit 3 alerts, in the same manner as in step S105. This alert is continued until
20 the calling party hangs up (S112).

The control unit 3 determines whether the auxiliary speech communication start key 42 is depressed (S113). If the control

unit 3 detects that the auxiliary speech communication start key 42 is depressed, it turns off the light-emitting portion 1 and stops the alert (S115), and the portable telephone set 20 is shifted to the speech communication mode (S116).

5 In step S113, if it is determined that the auxiliary speech communication start key 42 is not depressed, whether the light-detecting portion 2 detects light from the light-emitting portion 1 is determined again (S114). If the light-detecting portion 2 ceases to detect light from the light-emitting portion
10 1, the user has already noticed the reception of an incoming call and has opened the portable telephone set 20. Therefore, even if the speech communication start key 41 or auxiliary speech communication start key 42 is not depressed, the light-emitting portion 1 is turned off and the alert is stopped (S115), and the
15 portable telephone set 20 shifts to the speech communication mode (S116). In step S114, if the light-detecting portion 2 detects light from the light-emitting portion 1, it is determined that the portable telephone set 20 remains folded, and the alert is continued.

20 In this embodiment, the auxiliary speech communication start key 42 that can be depressed while the portable telephone set 20 is folded is provided. However, only the speech

communication start key 41 that can be depressed while the portable telephone set 20 is open may be provided. In this case, step S113 is omitted, and when a predetermined period of time lapses after the light-emitting portion 1 is turned on, whether
5 the light-detecting portion 2 detects light is determined. If the light-detecting portion 2 does not detect light, the portable telephone set 20 may directly shift to the speech communication mode.

Fig. 4 is a block diagram showing an example of the internal
10 arrangement of the control unit 3 in the portable telephone set 20 of the above embodiment. As shown in Fig. 4, according to this example, the control unit 3 has a circuit control system CPU 31, an operation system CPU 32, a TDMA 33, and a CODEC 34. The circuit control system CPU 31 controls the entire circuit operation. The
15 operation system CPU 32 is connected to the circuit control system CPU 31 to control the operation unit 4 and display 7. The TDMA 33 is connected to the radio unit 6 to control signal transmission/reception. The CODEC 34 is connected to the TDMA 33. The CODEC 34 decodes a received digital signal into an analog
20 signal and sends it to the microphone 8, and converts an analog signal input through the loudspeaker 9 into a digital signal.

CLAIMS

1. A foldable portable telephone set, which is foldable so as to be conveniently carried and allows a speech communication in an open state, and which has a light-emitting portion which emits light when an incoming call is received, and a light-detecting portion which detects light from said light-emitting portion, said light-detecting portion being able to detect light from said light-emitting portion in a folded state, and said light-detecting portion not being able to detect light from said light-emitting portion in the open state, said foldable portable telephone set having an automatic off-hook function with which, after light emission of said light-emitting portion is started when an incoming call is received, if light from said light-emitting portion is detected once by said light-detecting portion but is not detected by said light-detecting portion again immediately thereafter, said foldable portable telephone set automatically shifts to a speech communication mode even if speech communication start operation is not performed.

2. A telephone set according to claim 1, wherein said light-emitting portion maintains light emission only during a transition time between immediately after the termination and start of the speech communication mode.

3. A telephone set of claim 1 or claim 2, further comprising an auxiliary speech communication start key mounted on an exterior of said telephone set for manually selecting the speech communication mode regardless of whether said light detector receives the light emitted from said light source.

4. A foldable portable telephone set, comprising:

(a) a telephone set body with a first portion and a second portion which are hinged together and movable between a folded state in which said first and second portions overlap and an open state in which said first and second portions do not overlap;

(b) a light source mounted in said first portion for emitting a light when said telephone set receives an incoming signal directed to said telephone set;

(c) a light detector mounted in said second portion for receiving the light emitted from said light source only when said telephone set body is in said folded state; and

(d) a control section mounted in said telephone set body for receiving indications when said light source is emitting the light and when said light detector is receiving the emitted light and for shifting said telephone set to a speech communication mode automatically after the indication that said light detector is receiving the emitted light stops.

5. A telephone set of claim 4, further comprising an auxiliary speech communication start key mounted on an exterior of said telephone set body for manually selecting the speech communication mode regardless of whether said light detector receives the light emitted from said light source.

6. A method of operating a telephone set that has a first portion and a second portion that are hinged together and movable between a folded state in which the first and second portions overlap and an open state in which the first and second portions do not overlap, the method comprising the steps of:

emitting a light from the first portion when the telephone set receives an incoming call;

receiving the light emitted from the first portion at the second portion only when the telephone is in the folded state; and

shifting the telephone set to a speech communication mode automatically after reception of the emitted light stops at the second portion.

7. The method of claim 6, further comprising the step of stopping emission of the light from the first portion after reception of the emitted light stops at the second portion.

8. The method of claim 6, further comprising the step of

shifting the telephone set to a speech communication mode only upon manual selection of the speech communication mode when the second portion did not receive the emitted light.

9. The method of claim 6, further comprising the step of shifting the telephone to a speech communication mode by operation of a manual selector means mounted on an exterior of the telephone set regardless of whether the second portion received the emitted light.

10. The method of claim 6, wherein the telephone set is shifted to the speech communication mode at the time when the telephone set has moved from the folded state to the open state.

11. The method of claim 6, wherein the steps of emitting and receiving the light comprises the steps of projecting the light from a light source carried by the first portion toward a light detector carried by the second portion and being in a position directly opposite the light in the first portion when the telephone set is in the folded state, and stopping the light projection into the light detector when the telephone is moved from the folded state.

12. The method of claim 11, wherein the step of shifting the telephone set comprises the step of shifting the telephone set to the speech communication mode automatically immediately after

the light from the light source no longer projects into the light detector.

13. A communication system comprising:

a communication unit with a first portion and a second portion that are hinged together and movable between a folded state in which said first and second portions overlap and an open state in which said first and second portions do not overlap;

a light source mounted in said first portion for emitting a light when said communication unit receives an incoming signal directed to said communication unit;

a light detector mounted in said second portion for receiving the light emitted from said light source only when said communication unit is in said folded state; and

a control section mounted in said communication unit for receiving indications when said light source is emitting the light and when said light detector is receiving the emitted light and for shifting said communication unit to a speech communication mode automatically after the indication that said light detector is receiving the emitted light stops.

14. The system of claim 10, further comprising an auxiliary speech communication start key mounted on an exterior of said communication unit for manually selecting the speech

communication mode regardless of whether said light detector receives the light emitted from said light source.

15. The system of claim 10, wherein said control unit shifts said communication unit to the speech communication mode at the time when said communication unit has moved from the folded state to the open state.

16. A foldable portable telephone set substantially as herein described with reference to the accompanying drawings.

17. A method of operating a telephone set, the method being substantially as herein described with reference to the accompanying drawings.

18. A communication system substantially as herein described with reference to the accompanying drawings.



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Application No: GB 9813639.3
Claims searched: 1-18

Examiner: Robert Macdonald
Date of search: 9 December 1998

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.P): H4L(LECX, LECSX)

Int CI (Ed.6): H04B(1/40, 1/44, 1/48); H04M(1/02)

Other: ONLINE: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	US 5327584 (MATSUSHITA) Whole document	
A	JP 070074691 (SANYO) See Derwent abstract and enclosed Patent Abstract Of Japan.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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